

Fast Responding Pressure-Sensitive Paint for Large-Scale Wind Tunnel Testing, Phase I

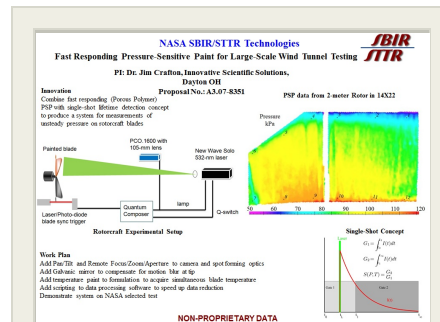
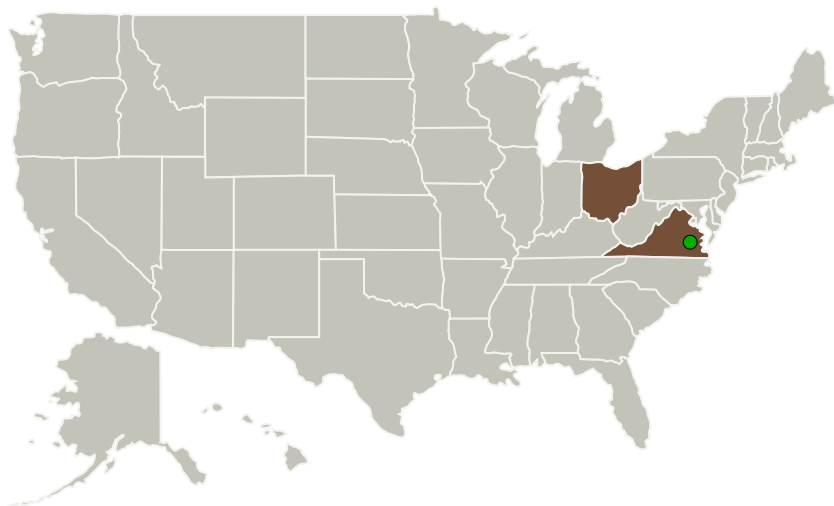
Completed Technology Project (2013 - 2013)



Project Introduction

The proposed work focuses on implementing fast-response pressure-sensitive paint for measurements of unsteady pressure in rotorcraft applications. Significant rotorcraft problems such as dynamic stall, rotor blade loads in forward flight, and blade-vortex interaction all have significant unsteady pressure oscillations that must be resolved in order to understand the underlying physics. Installation of pressure transducers is difficult and expensive on rotorcraft models, and the resulting data has limited spatial resolution. Application of a fast-responding pressure-sensitive paint should provide unsteady surface pressure distributed over the blade surface. Fast PSP measurements have been demonstrated at NASA Langley on a 2-meter rotor model in hover and in forward flight by the ISSI/OSU team using two single camera systems. More recently, measurements were conducted in forward flight using multiple cameras and lasers at two azimuthal positions. We propose expanding this system for production testing. This will be accomplished by adding remote control of the system interrogation region using remote focus/zoom/aperture lenses and pan/tilt stages combined with Ethernet hardware to control the systems remotely. Motion blur will be addressed using both a rotating mirror and de-convolution software. Data processing software will be customized to allow scripting of repetitive operations to speed up data processing. Finally, a temperature measurement capability will be added to the system to allow temperature corrections to be applied to the PSP data. These modifications to the system will improve accuracy and productivity during testing.

Primary U.S. Work Locations and Key Partners



Fast Responding Pressure-Sensitive Paint for Large-Scale Wind Tunnel Testing

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Images	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	3
Technology Areas	3
Target Destinations	3

Fast Responding Pressure-Sensitive Paint for Large-Scale Wind Tunnel Testing, Phase I

Completed Technology Project (2013 - 2013)



Organizations Performing Work	Role	Type	Location
Innovative Scientific Solutions, Inc.	Lead Organization	Industry	Dayton, Ohio
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations

Ohio	Virginia
------	----------

Project Transitions

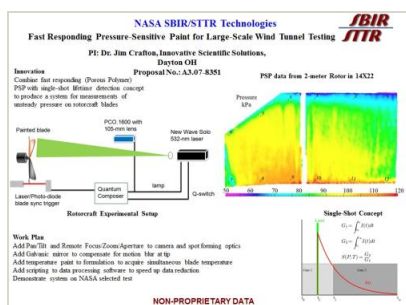
▶ **May 2013:** Project Start

✓ **November 2013:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140368>)

Images



Project Image

Fast Responding Pressure-Sensitive Paint for Large-Scale Wind Tunnel Testing
(<https://techport.nasa.gov/image/131649>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Innovative Scientific Solutions, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Jim Crafton

Co-Investigator:

James Crafton

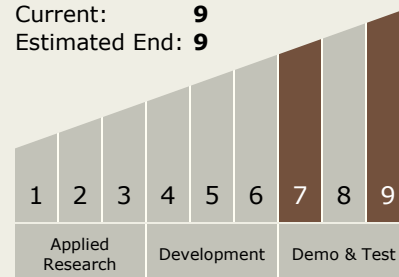
Fast Responding Pressure-Sensitive Paint for Large-Scale Wind Tunnel Testing, Phase I

Completed Technology Project (2013 - 2013)



Technology Maturity (TRL)

Start: **7**
Current: **9**
Estimated End: **9**



Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.3 In-Situ Instruments and Sensors
 - └ TX08.3.4 Environment Sensors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System